DOCUMENT RESUME

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ABSTRACT

After a discussion about what a parachute is and how it works, students create a parachute using different materials that they think will work best. They then test their designs, which is followed by a class discussion to highlight which paper material worked best. This activity requires a 60-minute time period for completion. (Author/SOE)

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Activity: **Design a Parachute**

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GRADE LEVELS: 6-8

SUMMARY:

After a discussion about what a parachute is and how it works, students will create a parachute using different materials that they think will work best. The students will test their designs, which will be followed by a class discussion (and possible journal writing) to highlight which paper material worked best.

LEVEL OF DIFFICULTY [1 = Least Difficult: 5 = Most Difficult]

1-least difficult

TIME REQUIRED

30 minutes for construction, 30 minutes for testing and classroom discussion/journal writing

COST

less than $10, possible to use any materials immediately at hand

STANDARDS:

1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (i.e., weight, strength, hardness and flexibility).

2.3 Describe and explain the purpose of a given prototype.

2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design.

2.5 Explain how such design features as size, shape, weight, function and cost limitations (i.e., ergonomics) would affect the construction of a given prototype.

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WHAT WILL THE STUDENTS LEARN?

What a parachute is and how it works.

Techniques for designing a parachute that falls slowly.

Determining which type of material works best by testing different options.

How air resistance plays a role in flying.

BACKGROUND INFORMATION:

A parachute is an umbrella-shaped device of light fabric used especially for making a safe jump from an aircraft.

Drag is the force that acts on a body (parachute) to slow down its motion through a fluid (air).

Air resistance is an opposing or slowing force that acts on anything moving through the air.

Without air resistance, or drag, objects would continue to increase speed until the object hit the ground.

The larger the object, the greater its air resistance. Parachutes use a large canopy to increase air resistance. This gives a slow fali and a soft landing.

RESOURCES:

www.parachutehistory.com – provides a history of parachutes and good pictures

www.glenbrook.k12.il.us/gbssci/phys/Class/newtlaws/u2l3e.html - explanation of air resistance with the use of diagrams

www.grc.nasa.gov/WWW/K-12/airplane/falling.html - explanation of air resistance

MATERIALS:

Tissue paper

Napkins

Construction paper

Newspaper

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Paper towels

String

Tape

Weights (i.e. washers)

PREPARATION:

Buy or gather available materials

DIRECTIONS:

1. Discuss with the class what a parachute is and how it works.

2. Have the each team brainstorm characteristics of a good parachute document their thoughts and sketch their design before construction begins.

Parachute Construction

1. Cut a circle from the paper you choose (or other shape that you may want to test). Make a hole in the center of the shape.

2. Cut six pieces of equal length string and tape them at equal distances around the edge of your shape.

3. Tape the other ends of the string to the weight.

4. To test: go outside and drop your parachute from a height to see if it flies slowly and lands gently.

Extension 1: Using the paper material that worked the best, you can do the same activity testing the size of the parachute. Have students test circles with different radii to find the optimal size.

Extension 2: Try parachutes with and without holes in the top and different sized holes.

Extension 3: Make parachutes out of different materials: plastics, cotton, nylon.

Extenstion 4: Have a competition to find a design that can land a toy vehicle most gently.

INVESTIGATING QUESTIONS:

What type of paper is the best material to make a parachute? Why?

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What didn't work as a good material? Why?

What changes could you make to improve your design?

REFERENCES:

Richards, Roy. An Early Start to Technology. Hemel Hempstead: Simon and Schuster Ltd, 1990, p.54.

Challoner, Jack. Flight (Make it Work.) World Book Inc, Chicago, 1998. pp. 18-19.

Rubric for Performance Assessment						
Activity Title: Design a				Grade		
	1	2	3	4	Weight	
Criteria	Beginning	Developing	Proficient	Advanced	(X factor)	Subtotal
CONSTRUCTION	Parachute is not constructed.	Parachute is constructed incorrectly.	Parachute constructed correctly.	Parachute shows good craftsmanship and creativity.		
RESULTS	Parachute not tested	Parachute falls quickly to the ground.	Parachute falls gently to the ground.	Parachute falls very slowly to the ground.		
REDESIGN	Student does not attempt to improve original design.	Student is unsuccessful at improving their original parachute design.	Student creates a parachute that works slightly better than their first one.	Student creates a second parachute that works much better than their first one.		
					Total:	
Teacher Comments:						

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PreK-12 ENGINEERING

Activity Evaluation Form

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Activity Name: _____

Grade Level the Activity was implemented at: _____

Was this Activity effective at this grade level (if so, why, and if not, why not)?

What were the Activity's strong points?

What were its weak points?

Was the suggested Time Required sufficient (if not, which aspects of the Activity took shorter or longer than expected)?

Was the supposed Cost accurate (if not, what were some factors that contributed to either lower or higher costs)?

Do you think that the Activity sufficiently represented the listed MA Framework Standards (if not, do you have suggestions that might improve the Activity's relevance)?

Was the suggested Preparation sufficient in raising the students' initial familiarity with the Activity's topic (if not, do you have suggestions of steps that might be added here)?

If there were any attached Rubrics or Worksheets, were they effective (if not, do you have suggestions for their improvement)?

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I. DOCUMENT IDENTIFICATION:

Title: PreK-12 Engineering Activities

1) Touch and Discover, Grades PreK-2
http://www.prek-12engineering.org/data/d2/Touchdiscover.pdf

2) Invent a Backscratcher from Everyday Materials, Grades PreK-2
http://www.prek-12engineering.org/data/d28/Backscratcher.pdf

3) Compare Human-Made Objects with Natural Objects, Grades PreK-5
http://www.prek-12engineering.org/data/d34/HumanvsNatural.pdf

4) Do Different Colors Absorb Heat Better?, Grades PreK-2
http://www.prek-12engineering.org/data/d37/Absorbheat.pdf

5) Which Roof is Tops?, Grades PreK-2
http://www.prek-12engineering.org/data/d44/RoofTops.pdf

6) Make Your Own Recycled Paper, Grades PreK-2
http://www.prek-12engineering.org/data/d56/Recycle.pdf

7) Build an Approximate Scale Model of an Object Using LEGOs, Grades 3-5
http://www.prek-12engineering.org/data/d3/LegoScaleModel.pdf

8) Design Weather Instruments using Lego Sensors, Grades 3-5
http://www.prek-12engineering.org/data/d4/LegoWeather.pdf

9) Space Shelter, Grades 3-5
http://www.prek-12engineering.org/data/d5/SpaceShelter.pdf

10) Build a Bird House, Grades 3-5
http://www.prek-12engineering.org/data/d6/BirdHouse.pdf

11) Ball Bounce Experiment, Grades 3-5
http://www.prek-12engineering.org/data/d6/BallBounce.pdf

12) Make an Alarm!, Grades 3-5
http://www.prek-12engineering.org/data/d11/MakeAlarm.pdf

13) Design Packing to Safely Mail Raw Spaghetti, Grades 3-5
http://www.prek-12engineering.org/data/d17/MailSpaghetti.pdf

14) Disassemble a Click Pen, Grades 3-5
http://www.prek-12engineering.org/data/d33/clickPen.pdf

15) Construct And Test Roofs for Different Climates, Grades 3-5
http://www.prek-12engineering.org/data/d35/ClimateRoof.pdf

16) Compare Fabric Materials, Grades 3-5
http://www.prek-12engineering.org/data/d36/Fabric.pdf

17) A House is a House for Me, Grades 3-5
http://www.prek-12engineering.org/data/d52/House.pdf

18) Water Filtration, Grades 3-5
http://www.prek-12engineering.org/data/d53/Water Filtration.pdf

19) What is the Best Insulator: Air, Styrofoam, Foil, or Cotton?, Grades 3-5
http://www.prek-12engineering.org/data/d54/BestInsulator.pdf

20) Design a Recycling Game!, Grades 3-5
http://www.prek-12engineering.org/data/d55/Recycling.pdf

21) Tower Investigation and the Egg, Grades 6-8
http://www.prek-12engineering.org/data/d7/TowerEgg.pdf

22) Wimpy Radar Antenna!, Grades 6-8
http://www.prek-12engineering.org/data/d10/WimpyAntenna.pdf

23) Portable Sundial, Grades 6-8
http://www.prek-12engineering.org/data/d30/PortableSundial.pdf

24) An Introduction To Loads Acting on Structures, Grades 6-8
http://www.prek-12engineering.org/data/d31/IntroLoads.pdf

25) Design Your Own Rube Goldberg Machine, Grades 6-8
http://www.prek-12engineering.org/data/d32/RubeGoldberg.pdf

26) Building Tetrahedral Kites, Grades 6-8
http://www.prek-12engineering.org/data/d38/tetrakites.pdf

27) Do as the Romans: Construct an Aqueduct!, Grades 6-8
http://www.prek-12engineering.org/data/d39/Aqueduct.pdf

28) Build an Earthquake City!!, Grades 6-8
http://www.prek-12engineering.org/data/d40/EarthquakeCity.pdf

29) Design a Parachute, Grades 6-8
http://www.prek-12engineering.org/data/d41/Parachute.pdf

30) The Squeeze is On, Grades 6-8
http://www.prek-12engineering.org/data/d42/Squeeze.pdf

31) Stop The Stretching, Grades 6-8
http://www.prek-12engineering.org/data/d43/StopStretching.pdf

32) Speaker Project, Grades 9-10
http://www.prek-12engineering.org/data/d13/Speaker.pdf

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